OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **WEBSTER LAKE, FRANKLIN,** the program coordinators have made the following observations and recommendations.

Thank you for your continued hard work sampling the lake this year! As you know, conducting multiple sampling events each year enables DES to more accurately detect water quality changes. Keep up the good work!

DES has been actively involved in two projects near Webster Lake. The first project is the Department of Transportation (DOT) Route 11 realignment in Franklin and Andover. The second project is located within the Sucker Brook Watershed.

New Hampshire Route 11 Realignment
In 2003, DES Biology Section met with Department of Transportation (DOT) personnel to discuss stormwater treatment and erosion control associated with the Route 11 realignment along Webster Lake in Franklin. As a result of that meeting, DOT incorporated both long-term and short-term water quality improvements into the project.

Long-term water quality improvements included installing concrete pavers at the boat launch parking area and an infiltration trench at the boat launch ramp, both of which will infiltrate runoff. These improvements will minimize the potential for sediment, hydrocarbon, and other pollutant deposition into the lake.

Short-term water quality improvements included weekly erosion control planning meetings to address potential water quality concerns, project phasing, limiting site disturbance, two or three site inspections and sampling events per week by erosion control specialists and DES, on-site rainfall tracking and recording, and Best Management Practices construction to manage stormwater runoff generated during significant rain events. These improvements were successfully communicated and implemented and, as a result, detrimental water quality impacts to wetlands, Sucker Brook, Chance Pond Brook and Webster Lake were avoided.

The Route 11 realignment project was completed during Summer 2006.

Sucker Brook Watershed
On November 12, 2003, DES met with the health officers for the Town of Franklin and Andover, to discuss elevated *E. coli* levels in Sucker Brook. The Brook extends from the outlet of Highland Lake in Andover and discharges on the west side of Webster Lake in Franklin. As a result of the meeting, DES became the lead agency to investigate the Brook and its watershed, and both Towns agreed to provide volunteer support during stormwater sample collection.

Following the initial subwatershed site investigation by DES in 2003, a scope of work was developed for the Sucker Brook watershed. The Sucker Brook Sampling Team collected seven rounds of samples at 12 stations along Sucker Brook and its tributaries. As a result of these efforts, two areas were identified as having elevated *E.coli* levels. Both areas were tributary streams to Sucker Brook located near Dyers Crossing and Hoyt Road.

More than 40 cows had unrestricted drinking water access to a perennial stream that directly discharges to Sucker Brook. After confirming that a nearby farm was partly responsible for elevated *E.coli* levels in Sucker Brook, DES contacted the Natural Resources Conservation Service (NRCS). Under the Environmental Quality Incentives Program (EQIP), NRCS works with local farmers, offering assistance for planning, designing, and installing conservation practices to protect water and properly care for domestic animals.

During the Summer of 2005, NRCS worked closely with the farm owner to secure funding to install a dug well, water line and water storage facility on the property. During the Spring of 2006, the farm installed 1,700 feet of three-strand barbed wire fencing to prevent the cows from accessing the stream. These farm improvements will have long-term positive impacts on surface water quality of the stream and the lake, reducing bacteria, and nutrients including phosphorus.

In 2006, DES conducted additional investigations and testing of Sucker Brook and its tributaries upstream of the Dyers Crossing intersection. This work along with an additional round of water sampling has led to two potential bacteria sources in the Sam Hill Road area. Additional sampling is anticipated for 2007.

At a separate location in 2005, DES conducted follow-up sampling for the Hoyt Road tributary where elevated *E.coli* levels had been documented. After bracketing the stream and properties potentially discharging *E.coli*, it was concluded that elevated *E.coli* levels were not of human or livestock origin, but likely native wildlife populations.

FIGURE INTERPRETATION

- **Figure 1 and Table 1:** Figure 1 in Appendix A shows the historical and current year chlorophyll-a concentration in the water column. Table 1 in Appendix B lists the maximum, minimum, and mean concentration for each sampling year that the lake has been monitored through VLAP.

  Chlorophyll-a, a pigment found in plants, is an indicator of the algal abundance. Because algae are usually microscopic plants that contain chlorophyll-a, and are naturally found in lake ecosystems, the chlorophyll-a concentration measured in the water gives an estimation of the algal concentration or lake productivity. **The median summer chlorophyll-a concentration for New Hampshire's lakes and ponds is 4.58 mg/m^3.**

  The current year data (the top graph) show that the chlorophyll-a concentration ***increased*** from **June** to **July**, ***decreased*** from **July** to **August**, and ***increased*** from **August** to **October.** *(The lake was not sampled in September.)*

  The historical data (the bottom graph) show that the **2006** chlorophyll-a mean is ***slightly greater than*** the state median and ***greater than*** the similar lake median. For more information on the similar lake median, refer to Appendix F.

  Overall, visual inspection of the historical data trend line (the bottom graph) shows a ***variable*** in-lake chlorophyll-a trend since monitoring began. Specifically, the mean chlorophyll concentration has ***fluctuated between approximately 2.46 and 7.30 mg/m^3*** since **1986**.

  In the **2007** biennial annual report, since your lake will have been sampled for at least **ten** consecutive years for chlorophyll, we will conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean chlorophyll-a concentration since monitoring began. Please refer to Appendix E for a detailed statistical analysis explanation.

  While algae are naturally present in all lakes, an excessive or increasing amount of any type is not welcomed. In freshwater lakes, phosphorus is the nutrient that algae typically depend upon for growth in New Hampshire lakes. Algal concentrations may increase as nonpoint sources of phosphorus from the watershed increase, or as in-lake phosphorus sources increase. Therefore, it is extremely important for volunteer monitors to continually educate all watershed residents about management practices that can be implemented to minimize phosphorus loading to surface waters.

- **Figures 2a and 2b and Tables 3a and 3b:** Figure 2a in Appendix A shows the historical and current year data for transparency without the use of a viewscope and Figure 2b shows the current year data for transparency with the use of a viewscope. Table 3a in Appendix B lists the maximum, minimum and mean transparency data without the use of a viewscope and Table 3b lists the maximum, minimum and mean transparency data with the use of a viewscope for each year that the lake has been monitored through VLAP.

  Volunteer monitors use the Secchi disk, a 20 cm disk with alternating black and white quadrants, to measure how far a person can see into the water. Transparency, a measure of water clarity, can be affected by the amount of algae and sediment in the water, as well as the natural color of the water. **The median summer transparency for New Hampshire's lakes and ponds is 3.2 meters.**

  The current year data (the top graph) show that the non-viewscope in-lake transparency ***increased*** from **June** to **July**, and then ***decreased gradually*** from **July** to **October.**

  The historical data (the bottom graph) show that the **2006** mean non-viewscope transparency is ***less than*** the state median and ***much less than*** the similar lake median. Please refer to Appendix F for more information about the similar lake median.

  The **2006** annual mean non-viewscope transparency is the ***shallowest (meaning least deep)*** annual mean that has been measured since monitoring began. It is likely that stormwater runoff laden with sediment and other organic debris, which flowed into the lake during the spring and periodically during the summer, contributed to the decreased transparency.

  The viewscope in-lake transparency was ***greater than*** the non-viewscope transparency on the **July** sampling event. The transparency was ***not*** measured with the viewscope on the **June, August,** or **October** sampling events. As discussed previously, a comparison of transparency readings taken with and without the use of a viewscope shows that the viewscope typically increases the depth to which the Secchi disk can be seen into the lake, particularly on sunny and windy days. We recommend that your group measure Secchi disk transparency with and without the viewscope on each sampling event.

  It is important to note that viewscope transparency data are not compared to a New Hampshire median or similar lake median. This is because lake transparency has not been historically measured by

DES with a viewscope. At some point in the future, the New Hampshire and similar lake medians for viewscope transparency will be calculated and added to the appropriate graphs.

Overall, visual inspection of the historical data trend line (the bottom graph) shows a ***decreasing, meaning worsening,*** trend for in-lake non-viewscope transparency since monitoring began in **1986.**

In the **2007** biennial annual report, since your lake will have been sampled for at least **ten** consecutive years for transparency, we will conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean chlorophyll-a concentration since monitoring began. Please refer to Appendix E for a detailed statistical analysis explanation.

Typically, high intensity rainfall causes sediment-laden stormwater runoff to flow into surface waters, thus increasing turbidity and decreasing clarity. Efforts should continually be made to stabilize stream banks, lake shorelines, disturbed soils within the watershed, and especially dirt roads located immediately adjacent to the edge of tributaries and the lake. Guides to best management practices that can be implemented to reduce, and possibly even eliminate, nonpoint source pollutants, are available from DES upon request.

- **Figure 3 and Table 8:** The graphs in Figure 3 in Appendix A show the amount of epilimnetic (upper layer) phosphorus and hypolimnetic (lower layer) phosphorus; the inset graphs show current year data. Table 8 in Appendix B lists the annual maximum, minimum, and median concentration for each deep spot layer and each tributary since the lake has been sampled through VLAP.

  Phosphorus is typically the limiting nutrient for plant and algae growth in New Hampshire's lakes and ponds. Excessive phosphorus in a lake can lead to increased plant and algal growth over time. **The median summer total phosphorus concentration in the epilimnion (upper layer) of New Hampshire's lakes and ponds is 12 ug/L. The median summer phosphorus concentration in the hypolimnion (lower layer) is 14 ug/L.**

  The current year data for the epilimnion (the top inset graph) show that the phosphorus concentration ***increased gradually*** from **June** to **August**, and then ***decreased*** from **August** to **October.**

  The historical data show that the **2006** mean epilimnetic phosphorus concentration is ***approximately equal to*** the state median and is ***greater than*** the similar lake median. Refer to Appendix F for more information about the similar lake median.

The current year data for the hypolimnion (the bottom inset graph) show that the phosphorus concentration ***increased*** from **June** to **July**, and then ***decreased gradually*** from **July** to **October.**

The turbidity of the hypolimnion (lower layer) sample was ***at least slightly elevated*** on each sampling event this year (**ranging from 1.69 to 8.41 NTUs**). In addition, the hypolimnetic turbidity has been ***at least slightly elevated*** on many sampling events during previous years. This suggests that the lake bottom is covered by a thick organic layer of sediment which is easily disturbed. When the lake bottom is disturbed, sediment, which typically contains attached phosphorus, is released into the water column. When collecting the hypolimnion sample, make sure that there is no sediment in the Kemmerer Bottle before filling the sample bottles.

The historical data show that the **2006** mean hypolimnetic phosphorus concentration is ***greater than*** the state median and the similar lake median. Please refer to Appendix F for more information about the similar lake median.

Visual inspection of the historical data trend line for the epilimnion and hypolimnion shows a ***variable, but overall decreasing, meaning improving,*** phosphorus trend since monitoring began in **1986**.

As discussed previously, in the **2007** biennial annual report, since your lake will have been sampled for phosphorus for at least **ten** consecutive years, we will conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean phosphorus concentration since monitoring began.

One of the most important approaches to reducing phosphorus loading to a waterbody is to continually educate watershed residents about the sources of phosphorus in a watershed and how excessive phosphorus loading can negatively affect the ecology and the recreational, economical, and ecological value of lakes and ponds.

TABLE INTERPRETATION

- **Table 2: Phytoplankton**

  Table 2 in Appendix B lists the current and historical phytoplankton species observed in the lake. Specifically, this table lists the three most dominant phytoplankton species observed in the sample and their relative abundance in the sample.

  The dominant phytoplankton species observed in the **June** sample were ***Tabellaria* (diatom), *Asterionella* (diatom),** and ***Rhizosolenia* (diatom).**

  The dominant phytoplankton species observed in the **July** sample were ***Rhizosolenia* (diatom), *Tabellaria* (diatom),** and ***Chrysosphaerella* (golden-brown).**

  The dominant phytoplankton species observed in the **October** sample were ***Tabellaria* (diatom), *Anabaena* (cyanobacteria),** and ***Melosira* (diatom).**

  Phytoplankton populations undergo a natural succession during the growing year. Please refer to the "Biological Monitoring Parameters" section of this report for a more detailed explanation regarding yearly plankton succession. Diatoms and golden-brown algae are typical in New Hampshire's less productive lakes and ponds.

- **Table 2: Cyanobacteria**

  The cyanobacterium ***Anabaena*** was the **second-most** dominant species observed in the **October** plankton sample. ***Anabaena*** was also observed in small amounts in the **June** and **July** plankton samples. In addition, a small amounts of the cyanobacterium ***Oscillatoria*** was observed in the **July** plankton sample. ***These species, if present in large amounts, can be toxic to livestock, wildlife, pets, and humans.*** Please refer to the "Biological Monitoring Parameters" section of this report for a more detailed explanation regarding cyanobacteria.

  Cyanobacteria can reach nuisance levels when phosphorus loading from the watershed to surface waters is increased and favorable environmental conditions occur, such as a period of sunny, warm weather.

  The presence of cyanobacteria serves as a reminder of the lake's delicate balance. Watershed residents should continue to act proactively to reduce nutrient loading to the lake by eliminating fertilizer use on lawns, keeping the lake shoreline natural, re-vegetating cleared areas within the watershed, and properly maintaining septic systems and roads.

In addition, residents should also observe the lake in September and October during the time of fall turnover (lake mixing) to document any algal blooms that may occur. Cyanobacteria have the ability to regulate their depth in the water column by producing or releasing gas from vesicles. However, occasionally lake mixing can affect their buoyancy and cause them to rise to the surface and bloom. Wind and currents tend to "pile" cyanobacteria into scums that accumulate in one section of the lake. If a fall bloom occurs, please collect a sample in any clean jar or bottle and contact the VLAP Coordinator.

- **Table 4: pH**

Table 4 in Appendix B presents the in-lake and tributary current year and historical pH data.

pH is measured on a logarithmic scale of 0 (acidic) to 14 (basic). pH is important to the survival and reproduction of fish and other aquatic life. A pH below 6.0 typically limits the growth and reproduction of fish. A pH between 6.0 and 7.0 is ideal for fish. The median pH value for the epilimnion (upper layer) in New Hampshire's lakes and ponds is **6.6**, which indicates that the surface waters in the state are slightly acidic. For a more detailed explanation regarding pH, please refer to the "Chemical Monitoring Parameters" section of this report.

The mean pH at the deep spot this year ranged from **6.46** in the hypolimnion to **6.74** in the epilimnion, which means that the water is ***slightly acidic.***

It is important to point out that the pH in the hypolimnion (lower layer) was ***lower (more acidic)*** than in the epilimnion (upper layer). This increase in acidity near the lake bottom is likely due to the decomposition of organic matter and the release of acidic by-products into the water column.

Due to the presence of granite bedrock in the state and acid deposition received from snowmelt, rainfall, and atmospheric particulates, there is not much that can be feasibly done to effectively increase lake pH.

- **Table 5: Acid Neutralizing Capacity**
  Table 5 in Appendix B presents the current year and historical epilimnetic ANC for each year the lake has been monitored through VLAP.

  Buffering capacity (ANC) describes the ability of a solution to resist changes in pH by neutralizing the acidic input. The median ANC value for New Hampshire's lakes and ponds is **4.9 mg/L**, which indicates that many lakes and ponds in the state are at least "moderately vulnerable" to acidic inputs. For a more detailed explanation about ANC, please refer to the "Chemical Monitoring Parameters" section of this report.

  The mean acid neutralizing capacity (ANC) of the epilimnion (upper layer) was **5.5 mg/L**, which is ***slightly greater than*** the state median. In addition, this indicates that the lake is ***moderately vulnerable*** to acidic inputs.

- **Table 6: Conductivity**
  Table 6 in Appendix B presents the current and historical conductivity values for tributaries and in-lake data. Conductivity is the numerical expression of the ability of water to carry an electric current, which is determined by the number of negatively charged ions from metals, salts, and minerals in the water column. The median conductivity value for New Hampshire's lakes and ponds is **40.0 uMhos/cm**. For a more detailed explanation, please refer to the "Chemical Monitoring Parameters" section of this report.

  The mean annual epilimnetic conductivity at the deep spot this year was **42.56 uMhos/cm**, which is ***slightly greater than*** the state median.

  The **2006** conductivity results for the deep spot and tributaries (except Asplund Bk) were ***lower than*** has been measured **during the past few years**. It is likely that the high water levels during **2006** diluted the ion concentration in surface waters throughout the watershed. Specifically, the unusually large amount of watershed runoff from the significant late spring rain events likely exceeded the amount of groundwater contribution to the tributaries and lake. In addition, any winter contribution of chloride to surface waters from road salt was likely flushed out of the tributaries and the lake before the lake stratified during the summer.

  The conductivity has ***increased*** at the **deep spot** and in the **Lake Avenue Tributary, Sucker Brook, Robidoux,** and the **Outlet** since monitoring began.

Typically, increasing conductivity indicates the influence of pollutant sources associated with human activities. These sources include failed or marginally functioning septic systems, agricultural runoff, and road runoff which contains road salt during the spring snow-melt. New development in the watershed can alter runoff patterns and expose new soil and bedrock areas, which could also contribute to increasing conductivity. In addition, natural sources, such as iron and manganese deposits in bedrock, can influence conductivity.

Therefore, we recommend that the **epilimnion** and the **tributaries** be sampled for chloride next year. This additional sampling may help us identify what areas of the watershed are contributing to the increasing in-lake conductivity.

Please note that there will be an additional cost for each of the chloride samples and that these samples must be analyzed at the DES laboratory in Concord. In addition, it is best to conduct chloride sampling in the spring as the snow is melting and during rain events.

- **Table 7a and Table 7b: Total Kjeldahl Nitrogen and Nitrite+Nitrate Nitrogen**

Table 7a in Appendix B presents the current year and historical Total Kjeldahl Nitrogen and Table 7b presents the current year and historical nitrite and nitrate nitrogen. Nitrogen is another nutrient that is essential for the growth of plants and algae. Nitrogen is typically the limiting nutrient in estuaries and coastal ecosystems. However, in freshwater, nitrogen is not typically the limiting nutrient. Therefore, nitrogen is not typically sampled through VLAP. However, if phosphorus concentrations in freshwater are elevated, then nitrogen loading may stimulate additional plant and algal growth. Please refer to the “Chemical Monitoring Parameters” section of this report for a more detailed explanation.

During the most recent DES Lake Assessment Program survey, which was conducted during Summer **1993** the ratio of the total nitrogen concentration to total phosphorus (TN:TP) concentration in the epilimnion sample was **12,** and in the hypolimnion sample was **13,** both of which are ***less than*** **15**, indicating that the lake is **nitrogen-limited**. This means that any additional **nitrogen** loading to the pond will stimulate additional plant and algal growth.

Therefore, we recommend that the lake and its tributaries be sampled for phosphorus and nitrogen on a routine basis.

For more information regarding nitrogen sampling, contact the VLAP Coordinator.

- **Table 8: Total Phosphorus**

Table 8 in Appendix B presents the current year and historical total phosphorus data for in-lake and tributary stations. Phosphorus is the nutrient that limits the algae's ability to grow and reproduce. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

The total phosphorus concentration in the **Beaver Brook** was ***slightly elevated*** on the **August** and **October** sampling events **(29 and 19 ug/L, respectively).** The turbidity of the samples was also ***slightly elevated*** (**4.05 and 2.21 NTUs, respectively).**

The total phosphorus concentration in the **Gagnes Brook** was ***elevated*** on the **August** sampling event **(63 ug/L).** The turbidity of the sample was also ***elevated*** (**5.33 NTUs).**

When the phosphorus and turbidity levels in a sample are elevated, it suggests that soil erosion is occurring upstream of the sampling location, or that the stream bottom was disturbed while sampling.

If you suspect that erosion is occurring in any area of the watershed, we recommend that your monitoring group conduct stream surveys and rain event sampling. This additional sampling may allow us to determine what is causing ***elevated*** levels of turbidity and phosphorus.

For a detailed explanation on how to conduct rain event sampling and stream surveys, please refer to the 2002 VLAP Annual Report special topic article, which is posted on the VLAP website at http://www.des.nh.gov/wmb/vlap/2002/documents/Appndxd_monitoring.pdf, or contact the VLAP Coordinator.

The total phosphorus concentration in the **Lake Avenue tributary** was ***at least slightly elevated*** on each sampling event this year **(ranging from 20 to 55 ug/L).** However, the turbidity of these samples was ***not particularly elevated*** **(ranging from 0.68 to 1.91 NTUs).** Due to the unusually high water levels and amount of rainfall during the spring and summer of **2006,** it is possible that wetland systems in this area of the watershed were releasing phosphorus-enriched water into the tributaries and ultimately into the lake.

- **Table 9 and Table 10: Dissolved Oxygen and Temperature Data**
  Table 9 in Appendix B shows the dissolved oxygen/temperature profile(s) collected during **2006**. Table 10 in Appendix B shows the historical and current year dissolved oxygen concentration in the hypolimnion (lower layer). The presence of dissolved oxygen is vital to fish and amphibians in the water column and also to bottom-dwelling organisms. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

  The dissolved oxygen concentration was ***much lower*** in the ***metalimnion (middle layer)*** and the ***hypolimnion (lower layer)*** than in the ***epilimnion (upper layer)*** at the deep spot on the **July** sampling event. As stratified lakes age, and as the summer progresses, oxygen typically becomes ***depleted*** in the hypolimnion by the process of decomposition. Specifically, the reduction of hypolimnetic oxygen is primarily a result of biological organisms using oxygen to break down organic matter, both in the water column and particularly at the bottom of the lake where the water meets the sediment.

  During this year, and many past sampling years, the lake has had a lower dissolved oxygen concentration and a higher total phosphorus concentration in the hypolimnion (lower layer) than in the epilimnion (upper layer). These data suggest that the process of ***internal phosphorus loading*** is occurring in the lake. When the hypolimnetic dissolved oxygen concentration is depleted to less than 1 mg/L in the hypolimnion, **as it was on the annual biologist visit this year and on many previous annual visits**, the phosphorus that is normally bound up with metals in the sediment may be re-released into the water column.

  Since an internal source of phosphorus in the lake may be present, it is even more important that watershed residents act proactively to minimize phosphorus loading from the watershed.

- **Table 11: Turbidity**
  Table 11 in Appendix B lists the current year and historical data for in-lake and tributary turbidity. Turbidity in the water is caused by suspended matter, such as clay, silt, and algae. Water clarity is strongly influenced by turbidity. Please refer to the "Other Monitoring Parameters" section of this report for a more detailed explanation.

  As discussed previously, the turbidity of the hypolimnion (lower layer) sample was ***at least slightly elevated*** on each sampling event this year, and it has been ***at least slightly elevated*** on many sampling events during previous years. This suggests that the lake bottom is covered by a thick organic layer of sediment which is easily disturbed. When the lake bottom is disturbed, sediment, which typically contains attached phosphorus, is released into the water column. When collecting the hypolimnion sample, make sure that there is no sediment in the Kemmerer Bottle before filling the sample bottles.

The turbidity of the epilimnion (upper layer) sample was ***slightly elevated*** on the **June** and **October** sampling events **(1.55 and 1.67 NTUs, respectively).** This suggests that a rainstorm may have recently contributed stormwater runoff to the lake and/or an algal bloom had occurred in the lake.

The turbidity of the metalimnion (middle layer) sample was ***at least slightly elevated*** on each sampling event this year **(ranging from 1.48 to 2.20 NTUs)** and has been during many previous years. This suggests that algae may have been present in this area of the lake. Algae are often found in the metalimnion of lakes due to the differences in density between the epilimnion and the hypolimnion and the resulting abundance of food.

As discussed previously, the turbidity and phosphorus in the **Beaver Brook** sample were ***slightly elevated*** on the **August** and **October** sampling events. In addition, the turbidity and phosphorus in the **Gagnes Brook** sample were ***slightly elevated*** on the **August** and **October** sampling events. When the phosphorus and turbidity levels in a sample are elevated, it suggests that soil erosion is occurring upstream of the sampling location, or that the stream bottom was disturbed while sampling.

If you suspect that erosion is occurring in any area of the watershed, we recommend that your monitoring group conduct stream surveys and rain event sampling. This additional sampling may allow us to determine what is causing ***elevated*** levels of turbidity and phosphorus.

For a detailed explanation on how to conduct rain event sampling and stream surveys, please refer to the 2002 VLAP Annual Report special topic article, which is posted on the VLAP website at http://www.des.nh.gov/wmb/vlap/2002/documents/Appndxd_monitoring.pdf, or contact the VLAP Coordinator.

- **Table 12: Bacteria (*E.coli*)**
  Table 12 in Appendix B lists the current year and historical data for bacteria *(E.coli*) testing. *E. coli* is a normal bacterium found in the large intestine of humans and other warm-blooded animals. *E.coli* is used as an indicator organism because it is easily cultured and its presence in the water, in defined amounts, indicates that sewage **may** be present. If sewage is present in the water, potentially harmful disease-causing organisms **may** also be present.

  The *E. coli* concentration in the **Lake Ave Trib** sample was ***elevated*** on the **August** sampling event. The concentration of **460** counts per 100 mL ***was greater than*** the state standard of 406 counts per 100 mL for recreational waters that are not designated public beaches.

  We recommend that your monitoring group conduct rain event sampling and bracket sampling next year in this area. This additional sampling may help us determine the source of the bacteria.

  For a detailed explanation on how to conduct rain event sampling and stream surveys, please refer to the 2002 VLAP Annual Report special topic article, which is posted on the VLAP website at http://www.des.nh.gov/wmb/vlap/2002/documents/Appndxd_monitoring.pdf, or contact the VLAP Coordinator.

- **Table 13: Chloride**
  Table 13 in Appendix B lists the current year and the historical data for chloride sampling. The chloride ion (Cl^-) is found naturally in some surfacewaters and groundwaters and in high concentrations in seawater. Research has shown that elevated chloride levels can be toxic to freshwater aquatic life. In order to protect freshwater aquatic life in New Hampshire, the state has adopted **acute and chronic** chloride criteria of **860 and 230 mg/L** respectively. The chloride content in New Hampshire lakes is naturally low, generally less than 2 mg/L in surface waters located in remote areas away from habitation. Higher values are generally associated with salted highways and, to a lesser extent, with septic inputs. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

  Chloride sampling was **not** conducted during **2006.**

- **Table 14: Current Year Biological and Chemical Raw Data**
  Table 14 in Appendix B lists the most current sampling year results. Since the maximum, minimum, and annual mean values for each parameter are not shown on this table, this table displays the current year "raw," meaning unprocessed, data. The results are sorted by station, depth, and then parameter.

- **Table 15: Station Table**
  As of the spring of 2004, all historical and current year VLAP data are included in the DES Environmental Monitoring Database (EMD). To facilitate the transfer of VLAP data into the EMD, a new station identification system had to be developed. While volunteer monitoring groups can still use the sampling station names that they have used in the past and are most familiar with, an EMD station name also exists for each VLAP sampling location. Table 15 in Appendix B identifies what EMD station name corresponds to the station names you have used in the past and will continue to use in the future.

DATA QUALITY ASSURANCE AND CONTROL

Annual Assessment Audit:

During the annual visit to your lake, the biologist conducted a sampling procedures assessment audit for your monitoring group. Specifically, the biologist observed the performance of your monitoring group while sampling and filled-out an assessment audit sheet to document the ability of the volunteer monitors to follow the proper field sampling procedures, as outlined in the VLAP Monitor's Field Manual. This assessment is used to identify any aspects of sample collection in which volunteer monitors failed to follow proper procedures, and also provides an opportunity for the biologist to retrain the volunteer monitors as necessary. This will ultimately ensure that the samples that the volunteer monitors collect are truly representative of actual lake and tributary conditions.

Overall, your monitoring group did an ***excellent*** job collecting samples on the annual biologist visit this year! Specifically, the members of your monitoring group followed the proper field sampling procedures and there was no need for the biologist to provide additional training. Keep up the good work!

Sample Receipt Checklist:

Each time your monitoring group dropped off samples at the laboratory this summer, the laboratory staff completed a sample receipt checklist to assess and document if your group followed proper sampling techniques when collecting the samples. The purpose of the sample receipt checklist is to minimize, and hopefully eliminate, future re-occurrences of improper sampling techniques.

Overall, the sample receipt checklist showed that your monitoring group did an ***excellent*** job when collecting samples and submitting them to the laboratory this year! Specifically, the members of your monitoring group followed the proper field sampling procedures and there was no need for the laboratory staff to contact your group with questions, and no samples were rejected for analysis.

USEFUL RESOURCES

Acid Deposition Impacting New Hampshire's Ecosystems, DES fact sheet ARD-32, (603) 271-2975 or www.des.nh.gov/factsheets/ard/ard-32.htm.

Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, DES Booklet WD-03-42, (603) 271-2975.

Best Management Practices for Well Drilling Operations, DES fact sheet WD-WSEB-21-4, (603) 271-2975 or www.des.nh.gov/factsheets/ws/ws-21-4.htm.

Biodegradable Soaps and Water Quality, DES fact sheet BB-54, (603) 271-2975 or www.des.nh.gov/factsheets/bb/bb-54.htm.

Canada Geese Facts and Management Options, DES fact sheet BB-53, (603) 271-2975 or www.des.nh.gov/factsheets/bb/bb-53.htm.

Cyanobacteria in New Hampshire Waters Potential Dangers of Blue-Green Algae Blooms, DES fact sheet WMB-10, (603) 271-2975 or www.des.nh.gov/factsheets/wmb/wmb-10.htm.

Erosion Control for Construction in the Protected Shoreland Buffer Zone, DES fact sheet WD-SP-1, (603) 271-2975 or www.des.nh.gov/factsheets/sp/sp-1.htm.

Freshwater Jellyfish In New Hampshire, DES fact sheet WD-BB-5, (603) 271-2975 or www.des.nh.gov/factsheets/bb/bb-51/htm.

Impacts of Development Upon Stormwater Runoff, DES fact sheet WD-WQE-7, (603) 271-2975 or www.des.nh.gov/factsheets/wqe/wqe-7.htm.

Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, DES fact sheet WD-BB-9, (603) 271-2975 or www.des.nh.gov/factsheets/bb/bb-9.htm.

Low Impact Development Hydrologic Analysis. Manual prepared by Prince George's County, Maryland, Department of Environmental Resources. July 1999. To access this document, visit www.epa.gov/owow/nps/lid_hydr.pdf or call the EPA Water Resource Center at (202) 566-1736.

Low Impact Development: Taking Steps to Protect New Hampshire's Surface Waters, DES fact sheet WD-WMB-16, (603) 271-2975 or www.des.nh.gov/factsheets/wmb/wmb-17.htm.

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